

REMARKS

Claims 2, 3, 10, 14, 15 and 16 remain canceled. Claims 1, 11 and 13 have been amended. Claims 1, 4-9, 11-13 and 17 remain in the application. Support for the amendments to the claims is identified herein. No new matter has been added. This application has been carefully considered in connection with the Examiner's Action. Reconsideration and allowance of the application, as amended, is respectfully requested.

Rejection under 35 U.S.C. §103

Claim 1:

Claim 1 recites a method of tracking an instrument that is inserted into the body of a patient, the method comprising the steps of:

- a) detecting a movement signal which represents movement phases of a periodic internal movement of the body, wherein the movement signal comprises both (i) an electrocardiogram movement signal and (ii) a breathing movement signal;
- b) generating 2D images of a body volume of interest, and storing each 2D image in an image database together with (i) associated imaging parameters and (ii) an associated movement phase;
- c) measuring (i) a current spatial position of the instrument and (ii) a corresponding movement phase of the periodic internal movement of the body comprising (ii)(a) an electrocardiogram movement signal and (ii)(b) a breathing movement signal;
- d) selecting at least one 2D image from the image database, wherein selecting the at least one 2D image takes place only in response to ascertaining whether (i) the at least one 2D image's associated movement phase corresponds to (ii) the movement phase belonging to the current measured spatial position of the instrument, otherwise the selecting does not take place;

- e) determining the position of the instrument on the at least one selected 2D image, wherein determining the position of the instrument on the at least one selected 2D image includes using interpolation to calculate a superposed position of the instrument on the 2D image, and wherein determining further includes compensating for a breathing-induced movement of a given body part within the body volume of interest based on a measured breathing position using a movement model of the body part; and
- f) superposing the determined position of the instrument on the at least one selected 2D image.

Claims 1, 11 and 13 have been amended for clarification. Support for the amendment to claim 1 (as well as for amendment to claims 11 and 13) can be found in the specification on at least page 3, lines 17-24 of the application as originally filed.

Claims 1, 4-9, 11-13 and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Strommer (US 2002/0049375 A1; hereafter **Strommer**), in view of Nehrke (US 2002/0026115 A1; hereafter **Nehrke**) and further in view of Simpson et al. (US 2001/0052899A1; hereafter **Simpson**). Applicant traverses this rejection on the grounds that these references are defective in establishing a prima facie case of obviousness with respect to claim 1.

As the PTO recognizes in MPEP § 2142:

... The examiner bears the initial burden of factually supporting any prima facie conclusion of obviousness. If the examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of nonobviousness...

It is submitted that, in the present case, the examiner has not factually supported a prima facie case of obviousness for at least the following reasons.

1. Even When Combined, the References Do Not Teach the Claimed Subject Matter

The **Strommer**, **Nehrke** and **Simpson** references cannot be applied to reject claim 1 under 35 U.S.C. § 103 which provides that:

A patent may not be obtained ... if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains ... (Emphasis added)

Thus, when evaluating a claim for determining obviousness, all limitations of the claim must be evaluated. However, since neither **Strommer**, **Nehrke** nor **Simpson** teaches "...**storing** each 2D image ... together with (i) associated imaging parameters and (ii) an associated movement phase ... **measuring** (i) a *current* spatial position of the instrument and (ii) a *corresponding movement phase* ... comprising (ii)(a) an electrocardiogram movement signal and (ii)(b) a breathing movement signal ... **selecting** ... wherein *selecting* the at least one 2D image *takes place only in response to ascertaining whether the at least one 2D image's associated movement phase corresponds to the movement phase belonging to the current measured spatial position of the instrument, otherwise the selecting does not take place* ... **determining** the position of the instrument on the at least one selected 2D image, wherein determining ... includes using *interpolation* to calculate a superposed *position* of the instrument on the 2D image, and ... further includes *compensating for a breathing-induced movement* of a given body part within the body volume of interest based on a measured breathing position using a *movement model* of the body part ..." as is claimed in claim 1, it is impossible to render the subject matter of claim 1 as a whole obvious, and the explicit terms of the statute cannot be met.

In addition, per the June 26, 2009 Office Action on page 2, the Examiner indicates that "Strommer fails to teach the movement signal comprising of both an

electrocardiogram movement signal and a breathing movement signal. Strommer does teach that it is within the skill of one in the art to select the appropriate medical monitoring device selected according to the inspected organ ([Strommer] Page 10, Para 0149)." The June 26, 2009 Office Action further states on page 2, that "Nehrke teaches that heart motion is a result of the cardiac cycle and respiratory motion ([Nehrke] Page 1, Para 0014). Therefore it would have been within the skill of one in the art to modify the method with the using the ECG and respiratory monitor of Strommer to compensate for the cardiac movement caused by the respiratory motion and the cardiac motion as taught by Nehrke in order to have a more accurate motion compensation ([Nehrke] Page 1, Para 0005).

In contrast, Applicant submits that the Examiner is mistaken with respect that it would have been within the skill of one in the art to modify the method of Strommer to compensate for cardiac movement caused by the respiratory motion and the cardiac motion taught by Nehrke in order to have a more accurate motion compensation.

In particular, **Strommer** at Page 10, Para 0149 states:

"[0149] Reference is now made to FIG. 6, which is a schematic illustration of a method for operating the three-dimensional imaging system 100, operative in accordance with a further preferred embodiment of the presented invention. *In procedure 230, the timing signal of an inspected organ is detected. The detection is performed by a medical monitoring device, which is selected according to the inspected organ.* For example, if the *inspected organs* are *blood vessels of the heart*, then the medical monitoring device is an *ECG monitor*. If the inspected organs are the *lungs*, then the medical device is a *respiratory rate monitor*. Special devices can be constructed for detecting the movement of the eye lid, the eye, and the like. For example, an MPS sensor can be attached to the eye lid for detecting the movement thereof. With reference to FIG. 1, ECG monitor 106 detects the organ timing signal through ECG-electrodes 128." (emphasis added).

Accordingly, **Strommer** teaches only that detection is performed by a medical monitoring device selected according to the inspected organ, and no more. The examples given by **Strommer** are *singular* in nature, i.e., blood vessels of the heart – ECG monitor; lungs – respiratory rate monitor; eye lid – special device constructed for detecting movement. For this reason, Strommer neither teaches nor suggests “**measuring** (i) a *current* spatial position of the instrument and (ii) a *corresponding movement phase* ... comprising (ii)(a) an electrocardiogram movement signal and (ii)(b) a breathing movement signal ...” as recited in Claim 1.

With respect to motion compensation, **Nehrke** discloses at Page 1, Para 0005-0009:

“[0005] It is an object of the present invention to propose a method of the kind set forth such that a comparatively *accurate motion compensation* is achieved in a simple manner. This object is achieved in accordance with the invention **by taking** the **following steps**:

[0006] **measuring** the variation in time of n correlated motion parameters during a *preparation phase preceding* the MR examination,

[0007] **measuring** m of said n motion parameters *during* the MR examination,

[0008] **deriving** the *motion parameters* that have **not** been measured during the MR examination from the measured motion parameters,

[0009] **varying** the *parameters of the sequence* in dependence on the *calculated or measured motion parameters* in order to **achieve motion compensation**.”
(emphasis added).

Accordingly, the motion compensation of **Nehrke** includes specific steps, for example, as outlined in paragraphs [0006] - [0009] of Nehrke. However, **Strommer** is silent with respect to any specific use of motion compensation in the method and

apparatus of **Strommer**. In other words, while **Strommer** discloses the use of a medical position system (MPS) including an imaging MPS sensor, **Strommer** does not teach or suggest any specific use of motion compensation in the method and apparatus of **Strommer**. Thus, the Examiner's position is mistaken. Applicant submits that it would not have been within the skill of one in the art to modify the method of Strommer to compensate for cardiac movement caused by the respiratory motion and the cardiac motion taught by Nehrke in order to have a more accurate motion compensation, as discussed above.

Thus, for at least the above reasons, the examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

2. The Combination of References is Improper

Assuming, arguendo, that the above argument for non-obviousness does not apply (which is clearly not the case based on the above), there is still another compelling reason why the **Strommer**, **Nehrke** and **Simpson** references cannot be applied to reject claim 1 under 35 U.S.C. § 103.

§ 2142 of the MPEP also provides:

...the examiner must step backward in time and into the shoes worn by the hypothetical 'person of ordinary skill in the art' when the invention was unknown and just before it was made.....The examiner must put aside knowledge of the applicant's disclosure, refrain from using hindsight, and consider the subject matter claimed 'as a whole'.

Here, neither **Strommer**, **Nehrke** nor **Simpson** teaches, or even suggests, the desirability of the combination since neither teaches the specific steps of "...**storing** each 2D image ... together with (i) associated imaging parameters and (ii) an associated movement phase ... **measuring** (i) a *current* spatial position of the instrument and (ii) a *corresponding movement phase* ... comprising (ii)(a) an

electrocardiogram movement signal and (ii)(b) a breathing movement signal ... **selecting** ... wherein *selecting* the at least one 2D image takes place only in response to ascertaining whether the at least one 2D image's associated movement phase corresponds to the movement phase belonging to the current measured spatial position of the instrument, otherwise the selecting does not take place ... **determining** the position of the instrument on the at least one selected 2D image, wherein determining ... includes using *interpolation* to calculate a superposed position of the instrument on the 2D image, and ... further includes *compensating* for a breathing-induced movement of a given body part within the body volume of interest based on a measured breathing position using a *movement model* of the body part ..." as specified above and as claimed in claim 1.

Thus, it is clear that none of the references provides any incentive or motivation supporting the desirability of the combination. Therefore, there is simply no basis in the art for combining the references to support a 35 U.S.C. § 103 rejection.

In this context, the MPEP further provides at § 2143.01:

The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.

In the above context, the courts have repeatedly held that obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination.

In the present case it is clear that the combination alleged by the Office Action arises solely from hindsight based on the invention without any showing, suggestion, incentive or motivation in either reference for the combination as applied to claim 1. Therefore, for this reason, the examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection under 35 U.S.C. §103 should be withdrawn.

Accordingly, claim 1 is allowable and an early formal notice thereof is requested. Dependent claims 4-9 depend from and further limit allowable independent claim 1 and therefore are allowable as well. Withdrawal of the rejection is respectfully requested.

Claim 11 has been amended in a manner similar to that of amended claim 1. For at least the same reasons as presented with respect to claim 1 above, claim 11 is believed prima facie allowable. Dependent claim 12 depends from and further limits allowable independent claim 11 and therefore is allowable as well. Accordingly, withdrawal of the rejection and an early formal notice of allowability is respectfully requested.

Claim 13 has been amended in a manner similar to that of amended claim 1. For at least the same reasons as presented with respect to claim 1 above, claim 13 is believed prima facie allowable. Dependent claim 17 depends from and further limits allowable independent claim 13 and therefore is allowable as well. Accordingly, withdrawal of the rejection and an early formal notice of allowability is respectfully requested.

Conclusion

Except as indicated herein, the claims were not amended in order to address issues of patentability and Applicants respectfully reserve all rights they may have under the Doctrine of Equivalents. Applicants furthermore reserve their right to reintroduce subject matter deleted herein at a later time during the prosecution of this application or a continuation application.

It is clear from all of the foregoing that independent claims 1, 11 and 13 are in condition for allowance. Dependent claims 4-9 depend from allowable independent claim 1, and are thus also allowable. Dependent claim 12 depends from allowable

independent claim 11, and thus is also allowable. Dependent claim 17 depends from allowable independent claim 13, and thus is also allowable.

Amendments herein are fully supported by the original specification and drawings as discussed herein; therefore, no new matter is introduced. Issuance of an early formal notice of allowance of claims 1, 4-9, 11-13 and 17 is requested.

Respectfully submitted,

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